The Impact of a Calcium Deficiency and Phytase Addition on Bone Mineralisation and Calcium and Phosphorus Metabolism in Piglets

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Phytase is now almost always added to swine diets to increase phosphorus (P) utilization efficiency as the P in its phytic acid form is weakly absorbed by pig. A calcium (Ca) deficiency can also increase the Ca and P utilization efficiency. This study aimed to evaluate factors that modulate P utilization, such as dietary Ca and phytase supplementation to optimize the metabolic utilization of P and Ca in piglets. A total of 48 piglets (15.6 kg ± 1.9) distributed per group of 2 in 24 pens received one of three treatments for a first 13-day phase: Control (Ca+ = 0.65%) and low Ca (Ca- = 0.39%) with a constant digestible P (dig P = 0.40%) and phytase treatment (Phyt, 750 FTU/kg), iso Ca and digestible P than the Control. During a second 14-day phase, piglets that received Ca+ and Ca- were fed a similar diet containing 0.65% Ca and 0.35% digestible P and Phyt piglets continued to receive the same treatment (750 FTU/kg, 0.65% Ca and 0.35% dig P). Growth performance and bone mineral content (BMC) and serum sample of one pig per pen were evaluated at the beginning and the end of each phase. Apparent total tract digestibility (ATTD) and retention coefficient (RC) of Ca and P were evaluated after each phase. During phase 1, the feed conversion ratio (FCR) was reduced for Phyt and Ca- piglets ($P < 0.05$). The BMC tended to be lower for Ca- compared to Ca+ ($P = 0.10$) and Phyt was intermediate. Piglets receiving Phyt had an increased Ca ($P < 0.05$) and P ATTD ($P < 0.05$) and P RC ($P < 0.05$). The Ca RC was higher for piglets receiving Ca- ($P < 0.05$) and Phyt was intermediate. The serum P tended to be increased for Ca- compared to Phyt ($P = 0.06$). During phase 2, growth performance and bone mineralisation were not affected by the dietary treatments. The Ca ATTD tended to be increased in Ca- compared to Phyt ($P = 0.09$). The Ca and P RC were increased by Phyt ($P < 0.05$). During the phase 1, the Ca deficiency induced a reduction of bone mineralisation but an increase in Ca utilization efficiency allowing then to compensate during the second phase. Phytase addition also increased the piglets Ca and P utilization efficiency during both phases. This project gives new data to increase weaning pigs Ca and P utilization efficiency considering that little is known about the impact of phytase or Ca variations on parameters other than growth performance during this stage.